

MICHIGAN ENVIRONMENTAL SCIENCE BOARD

INDOOR AIR INHALATION INVESTIGATION PANEL

MEETING SUMMARY

THURSDAY MARCH 30, 2000

COURTYARD BY MARRIOTT

7799 CONFERENCE CENTER DRIVE

BRIGHTON, MICHIGAN

PANEL MEMBERS PRESENT

Dr. Lawrence Fischer, Chairman

Dr. Ralph Kummler

Dr. David Long

Dr. Linda Abriola

Mr. Keith G. Harrison, Executive Director

MDEQ/OSEP SUPPORT STAFF PRESENT

Mr. Jesse Harrold, Environmental Officer

I. CALL TO ORDER

Dr. Lawrence Fischer called the meeting of the Michigan Environmental Science Board (MESB) Indoor Air Inhalation Investigation Panel (Panel) to order at 8:45 a.m.

II. EXECUTIVE DIRECTOR'S UPDATE

Mr. Keith Harrison indicated that all the material provided since the last meeting had been sent to the Panel members.

VI. PANEL DISCUSSION

Dr. Larry Fischer asked whether it would be reasonable to make a list of the assumptions used in the Johnson-Ettinger model. Dr. Ralph Kummler replied that this list was readily available, and that he had already written an evaluation of some of these assumptions. He noted that it was important to reach a balance between reasonable assumptions and reasonable input values. Dr. Linda Abriola added that choosing the correct parameters, such as depth of water table and type of soil was critical to justification of the model.

Dr. Kummler asked what percentage of remedial action plans submitted to the Michigan Department of Environmental Quality (MDEQ) in the past year had been approved. Mr. Andy Hogarth (MDEQ) replied that the 110 plans approved were a majority of those submitted. He added that most of these were approved using generic criteria. More complicated and more serious contamination problems tend to take longer and could either be pending, or have been withdrawn. All of those plans approved were reviewed for the air pathway. Conditions at a specific site might not be applicable to the generic

criteria. For example, a site with groundwater only two feet below the surface would not meet the requirement for the groundwater to be not less than three meters from ground surface, and thus would require the use of site-specific rather than generic criteria. Mr. Hogarth noted that in order to meet the criteria for generic residential cleanup, other pathway criteria, such as drinking water criteria would have to be met. These other criteria can be more restrictive than the indoor air inhalation criteria.

Dr. Abriola asked if there is a list of conditions that a site must meet in order to use the generic criteria and information on how exceptions are handled. Mr. Hogarth replied that there are guide sheets for each exposure pathway that address when specific criteria are applicable. The air exchange rate of a building is one parameter that can be assumed for the generic criteria, but also can be site specific. Dr. Abriola questioned whether false assumptions could be an issue. For example, if a soil was not tested, it might or might not be the type on which the assumptions were based. Mr. Hogarth stated that specific factors usually identified at a site included the depth of groundwater, materials used in construction of the building foundation, floor and walls, and whether the sump is encased. He noted that there was not a specified type of sample set required to show when criteria are exceeded. A single sample could be used to show levels in excess of criteria, but one sample slightly in excess combined with a significant number of samples with substantially less contamination would have a different impact. Updated guide sheets are being developed which deal with the issue of proper sample collection and numbers, valid sampling sites, and handling of data.

Dr. Long asked who was involved in site evaluations. Mr. Hogarth replied that there is a team of field staff who, with their district quality review team, make decisions regarding generic residential cleanup. Facility specific evaluations or limited closures are brought to personnel in Lansing. He added that generic criteria are essential to the approval process.

Dr. Fischer asked how chemical contaminant information is brought into the process. Mr. Jeffrey Crum (MDEQ) stated that the approximately 280 regulated chemicals have been screened using Henry's Law Constant to identify the volatile chemicals. Some chemicals have been designated as not likely to volatilize, and are not considered likely to enter the air from the soil. The list of hazardous substances is not definitive. If a chemical not currently considered is discovered to be volatile, a literature search is conducted to identify adequate data to establish necessary toxic endpoints. This is then used to develop criteria for that chemical.

Mr. Hogarth stated that the MDEQ does not know about and, therefore, does not oversee all cleanups in the state. A new purchaser of commercial property is required to do a baseline environmental assessment to define the condition of the property. This distinguishes new releases from those that occurred previously, but there is no requirement for the new owner to clean up the old releases. And only a small percentage of the approximately 3,000 baseline assessments submitted to the MDEQ over the past five years have been evaluated. A company can also evaluate contamination it has caused and implement a remedial action plan without notifying the

MDEQ. A high visibility contamination, however, can prompt a MDEQ investigation and necessitate an approved remedial action plan.

Dr. Fischer questioned if it was possible to document that indoor air contaminants were in fact coming from contamination in the soil directly into the building. Mr. James Milne (MDEQ) stated that there were instances of vapors getting into the basement or other indoor spaces from leaking underground storage tanks. Most often there was free product involved, but sometimes it emanated from soil or groundwater. Mr. Hogarth added that he was aware of sites where vapors originated from contaminated soil. He stated that in one example, indoor air samples exceeded acceptable concentrations until engineering controls were implemented to reduce the infiltration of vapor concentrations inside. Dr. Fischer asked whether these vapors could be identified as coming from the outside air, or directly from the soil through the foundation. Mr. Hogarth replied that in the example referenced, there was no other source identified other than from the soil into the building.

Mr. Crum reported that there was a Department of Transportation site in Colorado where the Johnson-Ettinger model was applied to a groundwater pool of chlorinated compounds. At this site, over 2,000 indoor air samples were obtained. It was reported that the model under-predicted what was found. Mr. Crum stated that he would provide a copy of this study to Mr. Harrison for the Panel members. Dr. Abriola noted that it was rare to find problems with a solute plume, as the diffusion through the capillary fringe is a slow process and typical plume concentrations are low. Mr. Crum added that results of a Massachusetts study, which used the Johnson-Ettinger model and which had been provided to the Panel earlier, indicated that there were problems with chlorinated solvents, but not other chemicals. Dr. Fischer asked whether these solute plumes also contained undissolved contaminants since it was noted that free product resulted in higher levels. Dr. Abriola stated that the generic residential criteria included 25 parts per million of perchlorethylene in the solute plume criteria. She stated that this level generally indicated the presence of naphthol, and questioned whether this high level was protective. However, it does not seem likely that a plume with only solute would be problematic. Mr. Hogarth replied that some sites in Michigan had problems with vinyl chloride solute, adding that vinyl chloride is quite volatile.

Mr. Hogarth noted that free product at a site, such as floating gasoline, would exceed calculated generic criteria. Other mechanisms also would address removal of free product, especially if it posed a hazard, such as explosion.

Dr. Kummler stated that it was somewhat premature to be making final conclusions about the model. He added that he would like to hear more from a Canadian study being conducted by Ian Hers and from any forthcoming industry perspectives as well as any alternative proposals. Dr. Long stated that the two alternatives to the proposed model for generic criteria were another model or using site-specific criteria to individually evaluate each contaminated site. Dr. Abriola added that any model would be based on similar principles, with similar results if the same kinds of parameter assumptions were made. There is, however, a range of reasonable values for these

parameters, which will result in a wide range of results. Dr. Kummler stated that another approach is to examine the sensitivity of the parameters as screening tools. Perhaps, there is a depth at which groundwater contamination would not be a concern. Mr. Crum replied that the model was one-dimensional and assumed homogenous soil between the groundwater and building with no depletion of source over time. However, extreme situations could also use site-specific calculations.

Mr. Harrison asked what difficulties industry was having with use of the generic criteria. Dr. Kummler indicated that the impression he had gotten from industry representatives that have approached him was that they did not consider the air exposure pathway to be critical. However, the Governor's charge and the evidence gathered to date suggest that this is an important pathway. Dr. Abriola asked whether there was documentation of instances where the generic criteria were exceeded and there was subsequent evidence of problems; that is, does exceeding the generic criteria for a site result in indoor air contamination? Mr. Hogarth indicated that there were not much data available on this subject. Dr. Kummler added that he was hopeful that information from the Canadian study would show data on cause and effect, as well as help to validate the model. When asked about the study in Colorado, Mr. Crum stated that the largest data gap was in soil characterization but that the groundwater was well characterized, as was air contamination levels. However, these data have not been analyzed as to whether the generic criteria developed in Michigan would be protective in a situation with similar concentrations. In order to use this information accurately, differences between the two states would have to be taken into consideration, including soil types and groundwater levels.

Dr. Long asked for clarification on the issue of free product. Mr. Hogarth stated that there could be other pathways involved besides volatilization into indoor air, including fire and explosion. In addition, if the calculated concentration is greater than the water solubility concentration, then the soil saturation value is used as a substitute criterion. If actual concentrations exceed either water solubility or soil saturation, then the situation is evaluated on a case-specific basis. Mr. Hogarth displayed a chart that showed the parameter input assumptions used for their generic criteria, as well as the parameter input assumptions used by the United States Environmental Protection Agency (USEPA) and the American Society for Testing and Materials (ASTM). Differences between inputs of these groups include Michigan-specific characteristics as opposed to national averages. Soil type and porosity, pressure differential, and capillary fringe diffusion are considered. A discussion narrative regarding the rationale for each of the input assumptions is included in the technical support document previously provided to the Panel. Mr. Crum noted that much of the work by the MDEQ in developing generic criteria was done in conjunction with consultation with the USEPA.

Mr. Hogarth presented another chart that showed how criteria change as each of the input parameters is changed. Some changes include building size, air exchange rate, source-building separation distance, and water and air filled porosity. One of the most sensitive input assumptions is vapor permeability that can vary throughout a single site, as well as from site to site. The permeability is multiplied by the pressure gradient to

calculate the flux. The acceptable concentration for groundwater is a function of not just diffusion, but is also modulated by the building zone of influence where evective forces take place. Dr. Abriola questioned the inclusion of air porosity in the capillary fringe. She stated that the usual definition of capillary fringe was the saturated zone above the water table that has no air in it. The inclusion of air would cause volatile compounds to diffuse faster. This would result in a more conservative assumption.

Dr. Long added that one goal of the Panel should be to justify the parameters chosen by the MDEQ, because there was a wide range of values which could result from differing parameters. It is possible to justify either the extra level of safety from considering extreme situations or the practicality of basing criteria on more realistic long-term exposure averages. Dr. Long stated that the charge given to this Panel was to evaluate the scientific basis for developing the generic cleanup criteria. In other words, whether the criteria were developed appropriately, not whether it was a good idea to have generic criteria. Mr. Crum noted that in comparison of indoor air criteria regarding benzene, MDEQ risk values associated with each of the criteria were comparable with those used by the USEPA and the ASTM.

Dr. Kummeler stated that it was necessary to examine the fundamental principles in the model as well as the model inputs. He added that as the groundwater gets deeper, the one-dimensionality of the model becomes a problem. In reality there is not a constant source, but rather there is some dilution due to spreading. Dr. Fischer asked about the feasibility of generic technology criteria that required changes in building ventilation to assure that exposures did not occur. Mr. Hogarth replied that this would only be necessary at sites where there was a need for limiting specific exposures. He stated that although a building on a site with excess contamination could be ventilated to achieve acceptable indoor air, the expectation with generic criteria is that these extra measures will not be necessary. Dr. Abriola stated that the model used a one-dimensional approach with readily accepted available equations, resulting in a conservative approach.

VII. PUBLIC COMMENT

Ms. Andrea Zajac (MDEQ) noted that the values used for the cleanup criteria affect more than just the MDEQ's Environmental Response Division cleanup program. She indicated the MDEQ's Storage Tank Division had closed out 1,026 underground storage tanks during the last fiscal year, with roughly just 12 to 15 percent using site-specific numbers. Ms. Zajac added that the number of closures had increased since the adoption of risk-based corrective action. Approximately six sites could not be closed due to problems with indoor air contamination.

VIII. PANEL ASSIGNMENTS

Dr. Abriola agreed to prepare a discussion on the consistency of the model with physical reality, possibly addressing the dimensionality and formulation. Dr. Kummeler volunteered to discuss the equations in a one-dimensional model, as well as the input

parameters and the sensitivity analysis. He also agreed to review any input from industry and to take a look at any proposed alternative models. Dr. Long stated that he could summarize the two studies conducted in Colorado and Massachusetts. Dr. Fischer offered to discuss the chemicals that were being regulated as one of the input parameters. Mr. Harrison noted that he would prepare the introductory materials, as well as integrate the various panel segments into a cohesive document. He also stated that he would try to arrange for Ian Hers to present the most recent information from the Canadian study to the Panel at its next meeting.

IX. ADJOURNMENT

The meeting was adjourned at 11:55 a.m.

Keith G. Harrison, M.A., R.S., Cert. Ecol.
Executive Director
Michigan Environmental Science Board